CALIFORNIA HIGH-SPEED TRAIN

Program Environmental Impact Report/Environmental Impact Statement

Statewide

AIR QUALITY TECHNICAL EVALUATION

January, 2004

Prepared for:

California High-Speed Rail Authority

U.S. Department of Transportation
Federal Railroad Administration

CALIFORNIA HIGH SPEED RAIL AUTHORITY

U.S. Department of Transportation
Federal Railroad Administration

CALIFORNIA HIGH-SPEED TRAIN PROGRAM EIR/EIS

Statewide

Air Quality Technical Evaluation

Prepared by:

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ACRONYMS

AQMD	Air Quality Management District
ARB	California Air Resources Board
Authority	California High-Speed Rail
CEQA	California Environmental Quality Act
COG	Council of Governments
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EPA	ENVIRONMENTAL PROTECTION AGENCY
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FTA	FEDERAL TRANSIT ADMINISTRATION
MTA	Metropolitan Transportation Authority
RTP	REGIONAL TRANSPORTATION PLAN

1.0 EXECUTIVE SUMMARY

1.1 BACKGROUND

The California High Speed Rail Authority (Authority) proposes a high-speed train (HST) system for intercity travel in California between the major metropolitan centers of Sacramento and the San Francisco Bay Area in the north, through the Central Valley, to Los Angeles and San Diego in the south. The HST system is projected to carry as many as 68 million passengers annually by the year 2020. The Authority adopted a final business plan (Business Plan) in June 2000, which examined the economic viability of a train system capable of speeds in excess of 200 miles per hour (mph) (322 kilometers per hour [kph]) on a fully grade-separated track, with state-of-the-art safety, signaling, and automated control systems. Following the adoption of the Business Plan, the Authority initiated this environmental review process for compliance with state and federal laws, in particular the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA).

The Authority is the project sponsor and the lead agency for purposes of the state CEQA requirements. The Federal Railroad Administration (FRA) is the federal lead agency for compliance under NEPA. The Federal Highway Administration (FHWA), U.S. Environmental Protection Agency (EPA), U.S. Army Corps of Engineers (USACE), Federal Transit Administration (FTA), Federal Aviation Administration (FAA), and U.S. Fish and Wildlife Service (USFWS) are cooperating agencies for the federal environmental review process. The Authority and the FRA, in consultation with the cooperating agencies, have determined that a program-level, or first tier, environmental document is appropriate for a statewide project of this scope. The draft program environmental impact report/environmental impact statement (Draft Program EIR/EIS) addresses the potential environmental impacts of the proposed HST system at a conceptual and planning level.

If the Authority should decide to proceed with the proposed HST system after the completion of this Program EIR/EIS process, the Authority envisions seeking possible future federal financial support for the system that may be provided through the FRA, which is within the U.S. Department of Transportation (DOT). The FRA and the DOT have several loan and loan guarantee programs that might be potential sources of future financial assistance. Although no existing grant or federal bond financing programs currently provide such support, several proposals to create such programs are pending before Congress.

In addition to possible funding, a Rule of Particular Applicability may be required from the FRA to establish safety standards for the proposed HST system for operating at speeds over 200 mph (322 kph) and for operations in shared-use rail corridors.

This Draft Program EIR/EIS analyzes a proposed HST Alternative and compares it with a No Project/No Action (No Project) Alternative and a Modal Alternative (potential improvements to the highways and airports serving the same intercity travel demand as the HST Alternative). This Draft Program EIR/EIS is being made available for public and agency comment. In the Final Program EIR/EIS, which will be prepared after the close of the public comment period on the Draft Program EIR/EIS, the Authority and the FRA may select a preferred HST corridor/alignment, general station locations, and recommended mitigation strategies, and may recommend further measures to consider in more detail at the project level to avoid and minimize potential adverse environmental impacts. Should the HST advance to the next stage of analysis, subsequent phases of project development would include project-specific environmental analysis for a segment or segments and station locations of the proposed HST system.

1.2 ALTERNATIVES (NO-BUILD, MODAL, HST)

1.2.1 No-Build/No-Project/No-Action Alternative

The Draft Program EIR/EIS compares the No Project, Modal, and HST Alternatives (Figure 1). For the No Project Alternative, both existing and future conditions (2020) are considered. The No Project Alternative represents the state's transportation system (highway, air, and conventional rail) as it existed in 1999–2000 and as it would be in 2020 with the addition of transportation projects currently programmed for implementation (already in funded programs/financially constrained plans) according to the State Transportation Improvement Program (STIP), regional transportation plans (RTPs) for all modes of travel, airport improvement plans, and intercity passenger rail plans.

The No Project Alternative addresses the geographic area serving the same intercity travel market as the proposed HST Alternative (generally, from Sacramento and the San Francisco Bay Area, through the Central Valley, to Los Angeles and San Diego). This alternative satisfies the statutory requirements under CEQA and NEPA for an alternative that does not include any new action or project beyond what is already committed.

As with all of the alternatives, the No Project Alternative is assessed herein for how it would satisfy the purpose and need and objectives regarding congestion, safety, reliability, and travel times. It is also evaluated for potential adverse impacts on the environment, and this information is used to compare the No Project Alternative with the potential impacts of the Modal and HST Alternatives.

Figure 1 - No Build / No Project

1.2.2 Modal Alternative

There are currently two primary modes of intercity travel between the major urban areas of Oakland/San Francisco, San Jose, Sacramento, the Central Valley, Los Angeles, and San Diego: vehicles on the interstate highway system and state highways, and commercial airlines. Automobile and air transportation account for over 98% of the intercity travel in California. Conventional passenger trains (Amtrak) on freight and/or commuter rail tracks and buses provide secondary modes of intercity travel. The Modal Alternative serves the markets identified for the HST Alternative. The Modal Alternative consists of possible or hypothetical potentially feasible expansions of highways and airports in order to reduce the potentially greater environmental impacts that would result from new facilities.

The Modal Alternative is described as a set of hypothetical improvements representing a possible response to projected intercity travel demand that will not be met by the No Project Alternative. For comparative analysis purposes, the Modal Alternative would provide equivalent capacity to serve a "representative demand" for intercity travel that is equivalent to the higher end figures expected for ridership on the HST system in 2020 HST according to the sensitivity analysis completed for the Business Plan. The representative demand comprises an estimated total of 68 million annual passengers, 58 million intercity passengers and 10 million long distance commuters. For this analysis, the same travel demand is assigned to the No Project, Modal, and HST Alternatives. Potential additional improvements or expansion of facilities to meet the representative demand are defined in the Modal and HST Alternatives, regardless of funding potential. The improvements described for each mode are capacity oriented (e.g., additional traffic lanes for highways with associated interchange reconfiguration and ramp improvements; additional gates and runways for airports). Overall, the highway improvements assumed under the Modal Alternative represent a total of over 2,970 additional lane miles (mi) (4,780 lane kilometers [km]). Two additional highway lanes would be required on most intercity highways, and as many as four additional lanes would be needed to meet forecasted demand in certain segments. Projected airport improvements would include nearly 60 new gates and five new runways statewide.

This Program EIR/EIS does not in any way recommend, endorse, or suggest that these improvements could or should be implemented at specific highways or airports. Neither is it assumed that an HST system would negate the potential need for some expansion of highways and airports in the state. The analysis of operations and travel conditions shows that automobile travel time, even with the highway improvements proposed under the Modal Alternative, would increase between San Francisco and Los Angeles from the current 6 hours (hrs) and 54 minutes (min) under the No Project in 2003 to 7 hrs and

24 min under the Modal Alternative in 2020. The estimated cost to implement the Modal Alternative would be nearly $82 billion.

1.2.3 High-Speed Train Alternative

The High-Speed Train Alternative represents the proposed action and was developed by considering a range of potential HST technologies, corridors, and alignment and station options within the corridors. Informed by previous studies and the scoping process, the Authority and the FRA evaluated potential HST corridors and defined those that would best meet the purpose of the proposed system. Through the screening process, reasonable and feasible technology, and alignment and station options were identified for analysis in this Program EIR/EIS. The general HST corridors and study regions are shown in Figure 4.

State-of-the-art, electrically powered, high-speed, steel-wheel-on-steel-rail technology is being considered for a proposed system that would serve the major metropolitan centers of California, extending from the San Francisco Bay Area and Sacramento, through the Central Valley, to Los Angeles and San Diego. State-of-the-art safety, signaling, and automated train-control systems would be used. By 2020, the proposed service would include approximately 86 weekday trains in each direction to serve the study area intercity travel market, with 64 of the trains running between northern and southern California and the remaining 22 trains serving shorter distance markets. Most passenger service is assumed to run between 6:00 a.m. and 8:00 p.m. The proposed system would be capable of speeds in excess of 200 mph (322 kph), and the projected travel times would be designed to compete with air and auto travel. For example, the projected travel time by HST between San Francisco and Los Angeles would be just under 2 hrs and 30 min, and between Los Angeles and San Diego it would be just over one hour. The route representing the highest return on investment from the Authority's Business Plan is used to represent the HST Alternative for general comparison and evaluation with the other system alternatives. This representative system was forecast to carry between 42 and 68 million passengers in 2020, with the potential to accommodate higher ridership by adding trains or using longer trains. For a conservative assessment of potential environmental impacts, the higher ridership forecast is used in describing the proposed HST Alternative and its impacts, and is referred to in the Program EIR/EIS as the "representative demand" ridership. However, for resource topics where the high-end ridership forecasts would result in potential benefits (e.g., energy, air quality, and travel conditions), additional analysis is included to address the impacts associated with the low-end forecasts.

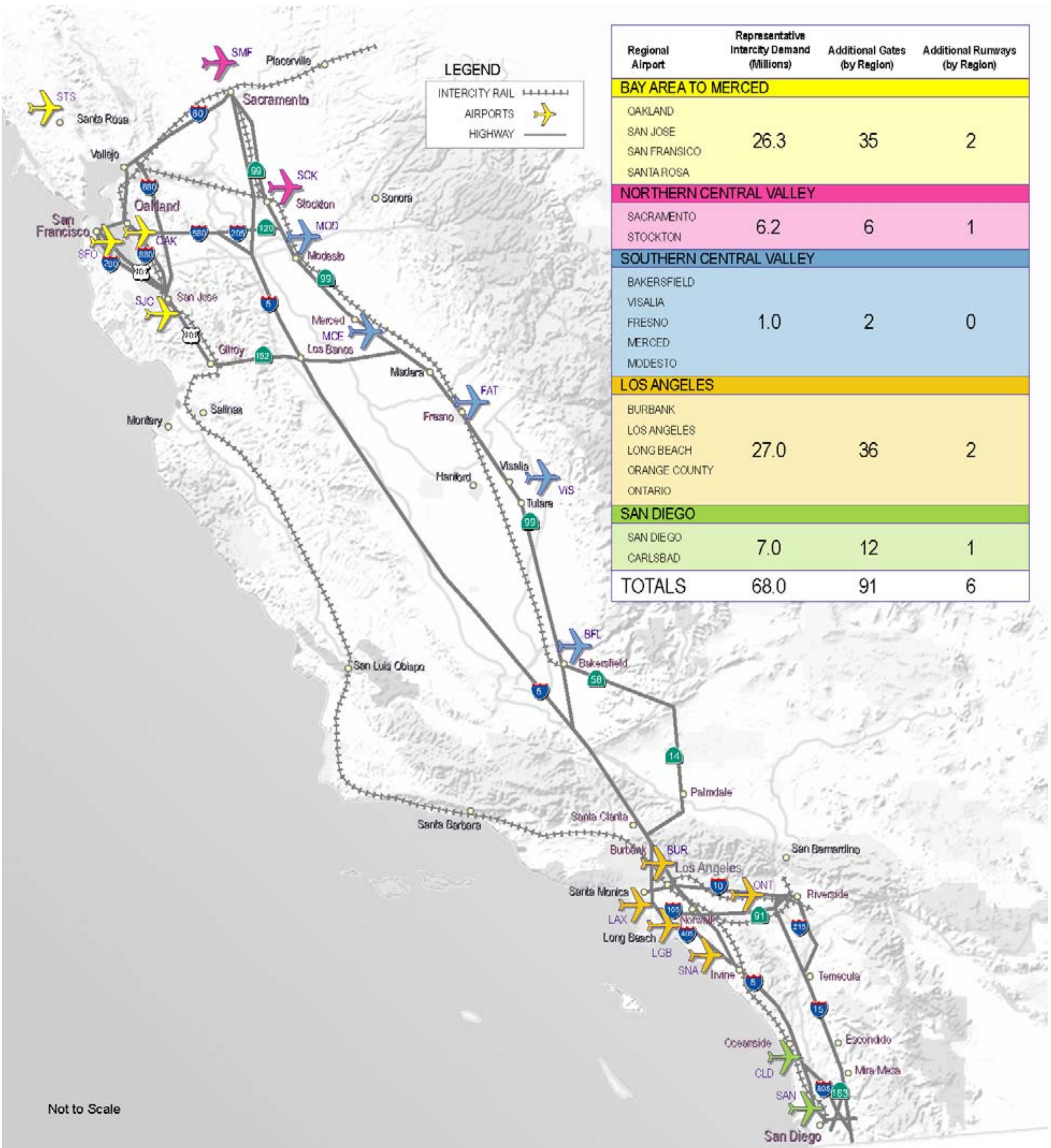
The proposed HST Alternative includes several corridor/alignment and station options. A steel-wheel-on-steel-rail electrified train is proposed, primarily on exclusive track with small portions of the route on shared track with other passenger rail operations. The train track would be at grade, in an open trench or tunnel, or on an elevated guideway, depending on terrain and physical constraints. To reduce potential environmental impacts, extensive portions of many of the alignment options are within or adjacent to existing rail or highway right-of-way, rather than on new alignment. Tunnel segments of the alignment are proposed through the mountain passes (Diablo Range/Pacheco Pass between south San Jose and the Merced, and the Tehachapi Mountains between Bakersfield and Sylmar).

The cost to implement the representative HST train system, which reflects a similar network of alignment and station options to that presented in the Authority's Business Plan, is estimated to range between $33 billion and $37 billion (2003 dollars), depending on the alignment and station options selected. The cost estimate includes right-of-way, track, guideway, tunneling, stations, and mitigation.

In the Los Angeles to San Diego via Orange County region, the proposed HST Alternative would extend no further south than from Los Angeles to Irvine. The use of conventional (non-electric) train technology from Los Angeles to San Diego along an improved LOSSAN rail corridor (currently used by Amtrak Surfliner, Metrolink, and the Coaster commute services) is being considered as part of this document. Using the technical data from this document, Caltrans and the FRA are also preparing a separate program EIR/EIS that considers conventional (non-electric) improvements on the LOSSAN corridor, since Caltrans would be responsible for those improvements.

Figure 2 - Modal Alternative, Highway Component

Figure 3 - Modal Alternative - Aviation Component



Regional Airport	Representative Intercity Demand (Millions)	Additional Gates (by Region)	Additional Runways (by Region)
BAY AREA TO MERCED			
OAKLAND SAN JOSE SAN FRANSICO SANTA ROSA	26.3	35	2
NORTHERN CENTRAL VALLEY			
SACRAMENTO STOCKTON	6.2	6	1
SOUTHERN CENTRAL VALLEY			
BAKERSFIELD VISALIA FRESNO MERCED MODESTO	1.0	2	0
LOS ANGELES			
BURBANK LOS ANGELES LONG BEACH ORANGE COUNTY ONTARIO	27.0	36	2
SAN DIEGO			
SAN DIEGO CARLSBAD	7.0	12	1
TOTALS	68.0	91	6

Figure 4 - High-Speed Train Alternative –
Corridors and Stations for Continued Investigation

2.0 BASELINE / AFFECTED ENVIRONMENT

This section provides an overview of the six air basins studied for this Program EIR/EIS and describes the composition of air pollutants in and status of these air basins. In addition, this section describes the potential impacts that may directly and indirectly affect state and regional air quality under the No Project, Modal, and proposed HST system alternatives, using the existing and No Project conditions for comparison.

2.1 GENERAL DISCUSSION OF AIR QUALITY RESOURCES

Air pollution is a general term that refers to one or more chemical substances that degrade the quality of the atmosphere. Eight air pollutants have been identified by the U.S. Environmental Protection Agency (EPA) as being of concern nationwide: carbon monoxide (CO), sulfur oxides (SO_x), hydrocarbons (HC), nitrogen oxides (NO_x), ozone (O_3), particulate matter sized 10 microns or less (PM_{10}), particulate matter sized 2.5 microns or less ($PM_{2.5}$) and lead (Pb). Except for HC, all of these pollutants (NO_x in the form of NO_2 and SO_x in the form of SO_2) are collectively referred to as criteria pollutants. Pollutants that are considered *greenhouse gases* also affect air quality. Greenhouse gases are gases that slow the passage of reradiated heat through the Earth's atmosphere. Greenhouse gases include, NO_x, HC, and carbon dioxide (CO_2). The sources of these pollutants, their effects on human health and general welfare, and their final deposition in the atmosphere vary considerably. Each pollutant is briefly described below.

2.1.1 Carbon Monoxide

Carbon monoxide (CO) is a colorless, odorless gas that is generated in the urban environment primarily by the incomplete combustion of fossil fuels in motor vehicles. Relatively high concentrations of CO can be found near crowded intersections and along heavily used roadways carrying slow-moving traffic. CO chemically combines with the hemoglobin in red blood cells to decrease the oxygen-carrying capacity of the blood. Prolonged exposure can cause headaches, drowsiness, or loss of equilibrium.

2.1.2 Sulfur Oxides

Sulfur oxides (SO_x) constitute a class of compounds of which sulfur dioxide (SO_2) and sulfur trioxide (SO_3) are of great importance in air quality. SO_x is also generated by the incomplete combustion of fossil fuels in motor vehicles. However, relatively little SO_x is emitted from motor vehicles. The health effects of SO_x include respiratory illness, damage to the respiratory tract, and bronchio-constriction.

2.1.3 Hydrocarbons

Hydrocarbons (HC) comprise a wide variety of organic compounds, including methane (CH_4), emitted principally from the storage, handling, and combustion of fossil fuels. Hydrocarbons are classified according to their level of photochemical reactivity: relatively reactive or relatively non-reactive. Non-reactive hydrocarbons consist mostly of methane. Emissions of total organic gases (TOG) and reactive organic gases (ROG) are two classes of hydrocarbons measured for California's emission inventory. TOG includes all hydrocarbons, both reactive and non-reactive. In contrast, ROG includes only the reactive HC. TOG is measured because non-reactive HC have enough reactivity, when present in large quantities, to play an important role in photochemistry. Though HC can cause eye irritation and breathing difficulty, their principal health effects are related to their role in the formation of ozone. HC is also considered a greenhouse gas.

2.1.4 Nitrogen oxides

Nitrogen oxides (NO_x) constitute a class of compounds that include nitrogen dioxide (NO_2) and nitric oxide (NO), both of which are emitted by motor vehicles. Although NO_2 and NO can irritate the eyes and nose and impair the respiratory system, NO_x, like HC, is of concern primarily because of its role in the formation of ozone. Nitrogen oxide is also considered a greenhouse gas.

2.1.5 Ozone

Ozone (O_3) is a photochemical oxidant that is a major cause of lung and eye irritation in urban environments. It is formed through a series of reactions involving HC and NO_x that take place in the atmosphere in the presence of sunlight. Relatively high concentrations of O_3 are normally found only in the summer because low wind speeds or stagnant air coupled with warm temperatures and cloudless skies provide the optimum conditions for O_3 formation. Because of the series of reactions involved in the formation of ozone and thus the relatively long reaction time involved, peak ozone concentrations often occur far downwind of the precursor emissions. Thus, ozone is considered a regional pollutant rather than a localized pollutant.

2.1.6 Particulate Matter

Particulate matter includes both airborne and deposited particles of a wide range of size and composition. Of particular concern for air quality are particles smaller than or equal to 10 microns and 2.5 microns in size, PM_{10} and $PM_{2.5}$, respectively. The data collected through many nationwide studies indicate that most PM_{10} is the product of fugitive dust, wind erosion, and agricultural and forestry sources, while a small portion is produced by fuel combustion processes. However, combustion of fossil fuels account for a significant portion of $PM_{2.5}$. Airborne particulate matter mainly affects the respiratory system.

2.1.7 Lead

Lead (Pb) is a stable chemical element that persists and accumulates both in the environment and in humans and animals. There are many sources of lead pollution, including mobile sources such as motor vehicles and other gasoline-powered engines, and non-mobile sources such as petroleum refineries. Lead levels in the urban environment from mobile sources have significantly decreased due to the federally mandated switch to lead-free gasoline. The principal effects of lead on humans are on the blood-forming, nervous, and renal systems.

2.1.8 Carbon Dioxide

Carbon dioxide (CO_2) is a colorless, odorless gas that occurs naturally in the earth's atmosphere. Significant quantities are also emitted into the air by fossil fuel combustion. CO_2 is considered a greenhouse gas. The natural *greenhouse effect* allows the earth to remain warm and sustain life. Greenhouse gases trap the sun's heat in the atmosphere and help determine our climate. As atmospheric concentrations of greenhouse gases rise, so may temperatures. Higher temperatures may result in more emissions, increased smog, and respiratory disease.

2.2 REGULATORY REQUIREMENTS

2.2.1 FEDERAL REGULATIONS

Air quality is regulated at the federal level under the Clean Air Act (CAA) and the Final Conformity Rule (40 C.F.R. Parts 51 and 93). The Clean Air Act Amendments of 1990 (Public Law (P.L.) 101-549, November 15, 1990) direct the EPA to implement strong environmental policies and regulations that will ensure cleaner air quality. According to Title I, Section 101, Paragraph F of the Clean Air Act Amendments (42 U.S.C. §§ 7401 et seq.): "No federal agency may approve, accept or fund any transportation plan, program or project unless such plan, program or project has been found to conform to any applicable state implementation plan (SIP) in effect under this act." Title 1, section 101 paragraph F of the amendments, amends Section 176(c) of the Clean Air Act to define *conformity* as follows: Conformity to an implementation plan's purpose of eliminating or reducing the severity and number of violations of the National Ambient Air Quality Standards (NAAQS) and achieving expeditious attainment of such standards; and that such activities will not:

- Cause or contribute to any new violation of any NAAQS in any area.
- Increase the frequency or severity of any existing violation of any NAAQS in any area.
- Delay timely attainment of any NAAQS or any required interim emissions reductions or other milestones in any area. (42 U.S.C. § 7506(c)(1)).

2.2.2 STATE REGULATIONS

Air quality is regulated at the state level by the California Air Resources Board (CARB), the agency designated to prepare the State Implementation Plan required by the federal Clean Air Act, under the California Clean Air Act of 1988 (Assembly Bill [AB] 2595) and other provisions of the California Health and Safety Code. (Health and Safety Code §§ 39000 et seq.) California's Clean Air Act requires all districts that are designated as nonattainment for any pollutant to "adopt and enforce rules and regulations to achieve and maintain the state and federal ambient air quality standards in all areas affected by emission sources under their jurisdiction".

The responsibility for controlling air pollution in California is shared by 35 local or regional air pollution control and air quality management districts, the California Air Resources Board (CARB), and the U.S. EPA. The districts issue permits for industrial pollutant sources and adopt air quality management plans and rules. CARB establishes the state ambient air quality standards, adopts and enforces emission standards for mobile sources, adopts standards and suggested control measures for toxic air contaminants, provides technical support to the districts, oversees district compliance, and approves local air quality plans and prepares and submits the state implementation plan (SIP) to the EPA. The EPA establishes NAAQS, sets emission standards for certain mobile sources (airplanes and locomotives), oversees the state air programs, and reviews and approves the SIP. The CARB inventories sources of air pollution in California's air basins and is required to update the inventory triennially, starting in 1998. (Health and Safety Code §§ 39607 and 30607.3.) The CARB also identifies air basins that are affected by transported air pollution. (Health and Safety Code § 39610; 17 C.C.R. Part 70500.)

2.2.3 NATIONAL AND STATE AMBIENT AIR QUALITY STANDARDS

As required by the Clean Air Act Amendments of 1970 (P.L. 91-064, December 31, 1970) and the Clean Air Act Amendment of 1977 (P.L. 95-95, August 7, 1977), the EPA has established NAAQS for the following air pollutants: CO, O_3, NO_2, PM_{10}, SO_x, and Pb. The California Air Resources Board has also established standards for these pollutants. Also, recent legislation requires CARB to develop and adopt regulations to reduce greenhouse gases (AB 1493, 2002). The federal and state governments have both adopted health-based standards for pollutants. For some pollutants, the national and state standards are very similar; for other pollutants, the state standards are more stringent. The differences in the standards are generally due to the different health effect studies considered during the standard-setting process and how these studies were interpreted.

Table 1 lists the National and State standards. The National primary standards are intended to protect the public health with an adequate margin of safety. The National secondary standards are intended to protect the nation's welfare and account for air-pollutant impacts on soil, water, visibility, vegetation, and other aspects of the general welfare. Areas that violate these standards are designated nonattainment areas. Areas that once violated the standards but now meet the standards are classified as maintenance areas. Classification of each area under the national standards is done by the EPA based on state recommendations and after an extensive review of monitored data. Classification under the state standards is done by the CARB.

Table 1
State and National Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards[1] Concentration[3]	California Standards[1] Method[4]	National Standards[2] Primary[3,5]	National Standards[2] Secondary[3,6,f]	National Standards[2] Method[7]
O_3	1 hour	0.09 ppm (180 ug/m^3)	Ultraviolet photometry	0.12 ppm (235 ug/m^3)[8]	Same as primary standard	Ultraviolet photometry
	8 hour	N/A		0.08 ppm (157 ug/m^3)[8]		
PM_{10}	24 hour	50 ug/m^3	Gravimetric or Beta Attenuation	150 ug/m^3	Same as primary standard	Inertial Separation and Gravimetric Analysis
	Annual arithmetic mean	20 ug/m^3		50 ug/m^3		
$PM_{2.5}$	24 hour	No Separate State Standard	Gravimetric or Beta Attenuation	65 ug/m^3	Same as primary standard	Inertial Separation and Gravimetric Analysis
	Annual arithmetic mean	12 ug/m^3		15 ug/m^3		
CO	8 hour	9.0 ppm (10 mg/m^3)	Non-dispersive infrared photometry (NDIR)	9 ppm (10 mg/m^3)	None	Non-Dispersive Infrared Photometry (NDIR)
	1 hour	20 ppm (23 mg/m^3)		35 ppm (40 mg/m^3)		
	8 hour (Lake Tahoe)	6 ppm (7 mg/m^3)		N/A		
NO_2	Annual arithmetic mean	N/A	Gas phase chemilum-incescence	0.053 ppm (100 ug/m^3)	Same as primary standard	Gas Phase Chemilum-Incescence
	1 hour	0.25 ppm (470 ug/m^3)		N/A		
Pb[9]	30 days average	1.5 ug/m^3	Atomic Absorption	N/A	N/A	High Volume Aampler and Atomic Absorption
	Calendar quarter	N/A		1.5 ug/m^3	Same as primary standard	
SO_2	Annual arithmetic mean	N/A	Ultraviolet Fluorescence	0.030 ppm (80 ug/m^3)	N/A	Spectrophotometry (Pararosoani-line method)
	24 hour	0.04 ppm (105 ug/m^3)		0.14 ppm (365 ug/m^3)	N/A	
	3 hour	N/A		N/A	0.5 ppm (1300 ug/m^3)	
	1 hour	0.25 ppm (655 ug/m^3)		N/A	N/A	

Pollutant	Averaging Time	California Standards[1]		National Standards[2]		
		Concentration[3]	Method[4]	Primary[3,5]	Secondary[3,6,f]	Method[7]
Visibility reducing particles	8 hour (10 a.m. to 6 p.m., Pacific Standard Time)	In sufficient amount to produce an extinction coefficient of 0.23 per km-visibility of 10 mi (16 km) or more (0.07–30 mi [.011–48 km] or more for Lake Tahoe) due to particles when the relative humidity is less than 70 percent. Method: Beta Attenuation and Transmittance through Filter Tape.		No federal standards		
Sulfates	24 hour	25 ug/m^3				
Hydrogen sulfide	1 hour	0.03 ppm (42 ug/m^3)	Ultraviolet Fluorescence			
Vinyl Chloride[9]	24 hour	0.01 ppm (26 ug/m^3)	Gas Chromatography			

1. California standards for O_3, CO (except Lake Tahoe), SO_2 (1 and 24 hour), NO_2, suspended particulate matter-$PM_{10,}$ $PM_{2.5}$, and visibility reducing particles, are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.
2. National standards (other than O_3, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration in a year, averaged over 3 years, is equal to or less than the standard. For $PM_{10,}$ the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 ug/m3 is equal to or less than one. For PM2.5, the 24 hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standards. Contact EPA for further clarification and current federal policies.
3. Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25^o C (77^o F) and a reference pressure of 760 mm (30 in) of mercury. Most measurements of air quality are to be corrected to a reference temperature of 25^o C (77^o F) and reference pressure measurements of air quality are to be corrected to a reference temperature of 25o C (77^o F) and a reference pressure of 760 mm (30 in) of mercury (1,013.2 milibar [1 atmosphere]); ppm in this table refers to ppm volume, or micromoles of pollutant per mole of gas.
4. Any equivalent procedure that can be shown to the satisfaction of CARB to give equivalent results at or near the level of the air quality standard may be used.
5. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.
6. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.
7. Reference method as described by EPA. An "equivalent method" of measurement may be used but must have a "consistent relationship to the reference method" and must be approved by EPA.
8. New federal 8-hour O3 and PM2.5 standards were promulgated by U.S. EPA on July 18, 1997. Contact U.S. EPA for further clarification and current federal policies.
9. The ARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

Source: California Air Resources Board (7/9/03)

2.3 STUDY AREA DEFINED

California is divided into 15 air basins. (17 C.C.R 60100 et seq.) Each has unique terrain, meteorology, and emission sources. This analysis has been structured to estimate the potential impacts on the six air basins directly affected by the proposed alternatives, as illustrated in Figure 5. The basins considered in this study are:

- Sacramento Valley.
- San Francisco Bay Area.
- San Joaquin Valley.
- Mojave Desert.
- South Coast.
- San Diego County.

For this program-level analysis, potential impacts on air quality are described only for the air basins that physically contain the proposed alternatives. Air quality in the nearby air basins could also be affected by changes in travel patterns, miles traveled and regional pollutant transport resulting from the proposed alternatives, however these effects are expected to be less than those experienced by the six basins. Statewide assessments are made based on the changes predicted in the six air basins. Once the alternatives are refined and more detailed analyses are conducted, nearby basins should be studied as well.

2.3.1 AIR BASIN ATTAINMENT STATUS

The air quality attainment status based on state and national standards for CO, particulate matter, and O_3 for each of the air basins in the study area is shown in Table 2. All air basins are assigned an *attainment status* for air pollutants based on meeting state and federal pollutant standards. There are some differences between state and federal standards, so that a pollutant might have a different designation with each standard. A basin is considered in *attainment* for a particular pollutant if it meets the standards set for that pollutant. A basin is considered in *maintenance* for a pollutant if the standards were once violated but are now met. And a basin is considered *nonattainment* for a particular pollutant if its air quality exceeds standards for that pollutant. A basin is considered unclassified if the area cannot be classified on the basis of available information as meeting or not meeting the applicable standard.

Figure 5

Air Basins affected by Project

Table 2
Attainment Status of Affected Air Basins

Air Basin	Pollutant					
	CO		PM_{10}		O_3	
	National Standard	State Standard	National Standard	State Standard	National Standard	State Standard
Sacramento Valley	Maintenance	Unclassified/ Attainment	Portions unclassified/ portions nonattainment	Nonattainment	Portions Unclassified-Attainment/ portions Nonattainment	Nonattainment/ portions nonattainment-transitional
San Francisco Bay Area	Maintenance	Attainment	Unclassified	Nonattainment	Nonattainment	Nonattainment
San Joaquin Valley	Maintenance	Unclassified/ Attainment	Nonattainment	Nonattainment	Nonattainment	Nonattainment
Mojave Desert	Unclassified/ attainment	Unclassified/ Attainment	Nonattainment	Nonattainment	Portions Unclassified-Attainment/ portions Nonattainment	Nonattainment
South Coast	Nonattainment	Non-Attainment/ Transitional	Nonattainment	Nonattainment	Nonattainment	Nonattainment
San Diego County	Maintenance	Attainment	Unclassified	Nonattainment	Nonattainment	Nonattainment
Source: California Air Resources Board 2002						

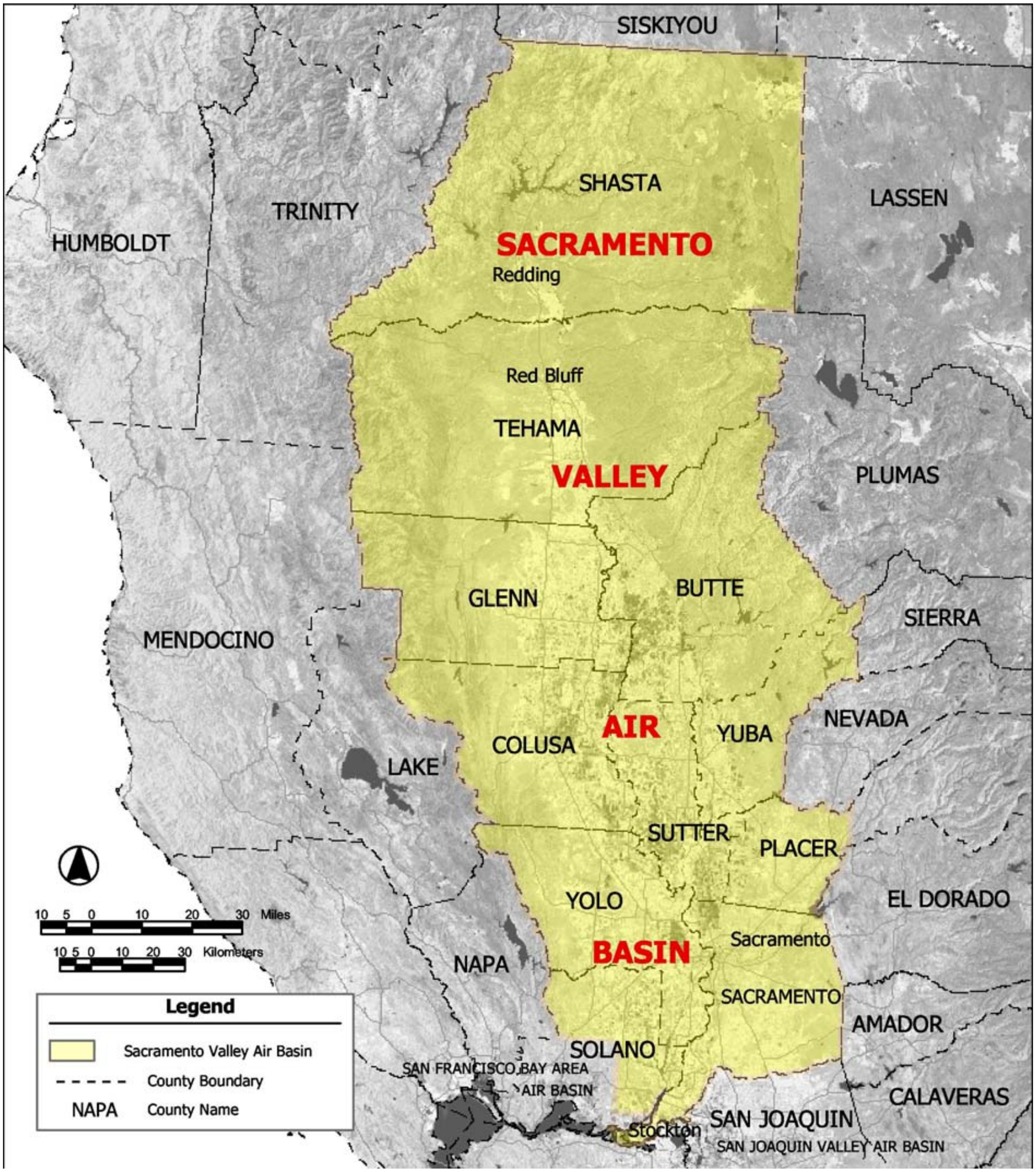
2.3.2 Air Basins Descriptions

A SACRAMENTO VALLEY AIR BASIN

The Sacramento Valley Air Basin, shown in Figure 6, is located in the northern portion of the Central Valley. The Sacramento Valley Air Basin includes Butte, Colusa, Glenn, Sacramento, Shasta, Sutter, Tehama, Yolo and Yuba counties, along with the western urbanized portion of Placer County and the eastern portion of Solano County. The Sacramento Valley Air Basin covers over 15,000 square miles and has a population of more than two million people. It is the fifth most populated air basin in the State.

Figure 6

Sacramento Valley Air Basin



The basin is classified as state nonattainment area for Ozone (1-hour standard). The Sacramento Region (Butte, Yuba, Sutter, Placer, Sacramento, Solona and Yola) is classified as a national nonattainment area for Ozone (1-hour standard). The Sacramento region along with Shasta and Tehema Counties have been recommended to be designated a nonattainment area for the national 8-hour ozone standard.

The Sacramento Valley Air Basin is classified as a nonattainment area for the State PM10 standard and as an unclassified area for the National PM10 standard.

The basin is classified as either unclassified or attainment for both the State and National CO standards.

The location of the air basin causes the area to have a more extreme climate as compared to the nearby San Francisco Bay Area Air Basin. Winters are usually cool and wet. Summers are hot and dry. The emission inventory is dominated by the Sacramento metropolitan area. On-road motor vehicles are the primary source of emissions in the metropolitan area. Population in the air basin grew between 1981 and 2000 by 51 percent, higher than the 39 percent increase statewide. VMT increased by 95%, slightly higher than the 91% increase statewide. As shown in Figures 7 and 8, respectively, emissions of the O3 precursors, NOx and ROG have decreased since 1990 and are projected to continue declining through 2010. This is the result of more stringent mobile source emission standards and cleaner burning fuels. ROG emissions have also declined due to new rules controlling various industrial coating and solvent operations.

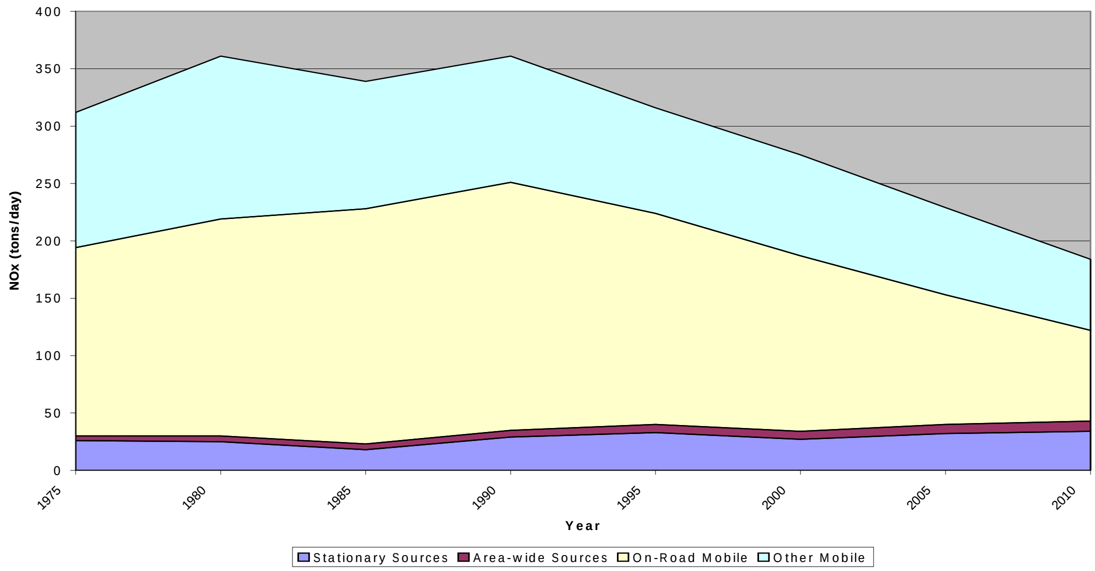


Figure 7 – Sacramento Valley Air Basin

NOx Emission Trend (tons/day, annual average)

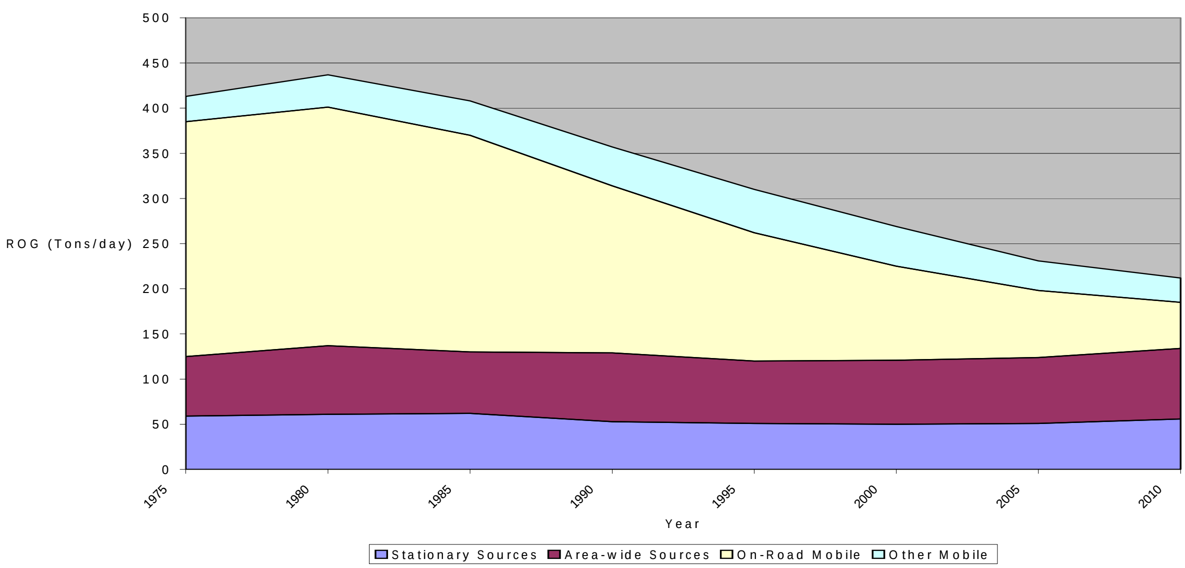


Figure 8 – Sacramento Valley Air Basin

ROG Trend (Tons/day, annual average)

While emission levels of ozone precursors are decreasing, peak ozone values in the Sacramento Valley Air Basin have not declined as quickly as compared to other urban areas. As shown in

9, the maximum peak 1-hour values remained fairly constant during the 1980s. Since 1988, the peak values have decreased slightly, and the overall decline for the 20-year period is about 15 percent. Based on this data, it is apparent that additional emission controls will be needed to bring the area into attainment for the State and national ozone standards.

As shown in Figure 10, direct emissions of PM10 are increasing in the Sacramento Valley Air Basin. This increase is due to growth in emissions from area-wide sources, primarily fugitive dust from paved and unpaved roads, construction and demolition, and residential fuel combustion. These area-wide emission sources have increased due to population growth and increased VMT. Mobile and stationary sources have remained relatively steady.

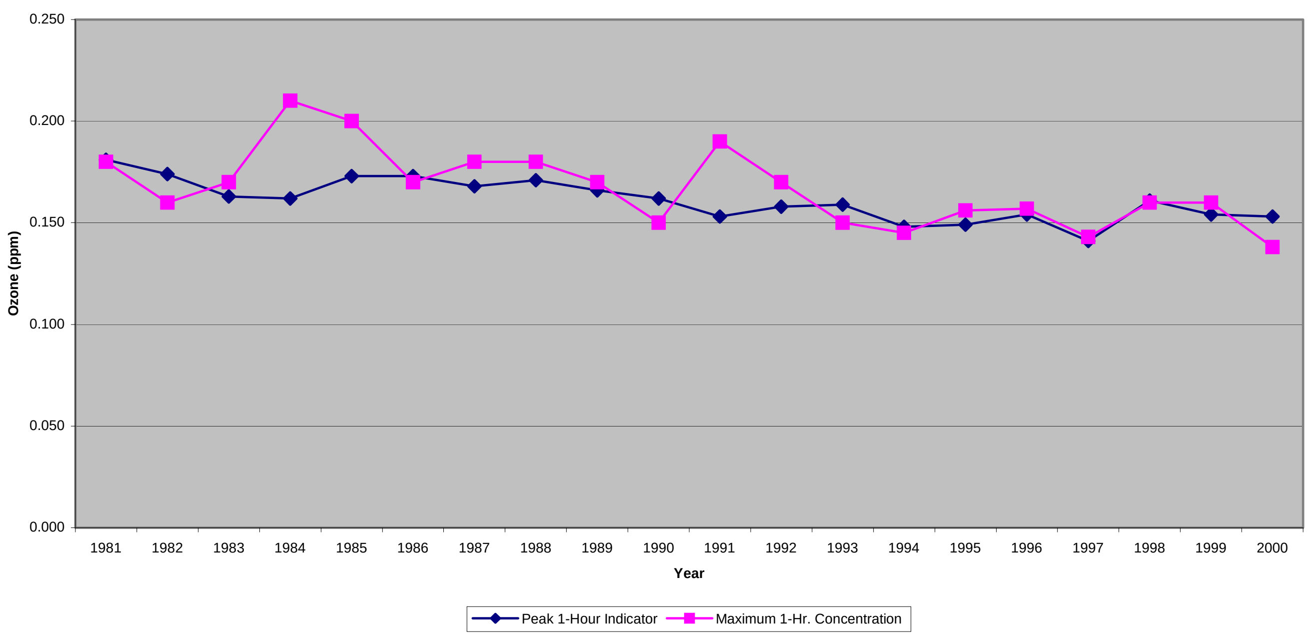


Figure 9 - Sacramento Valley Air Basin Ozone Trend